



## Lesson Title: Train Like an Astronaut

### DESCRIPTION

This lesson is a physical and inquiry-based approach to human health and fitness on Earth and in space. Students can participate in physical activities modeled after the real-life physical requirements of humans traveling in space.

### OBJECTIVES

Students will:

- Set goals and challenge themselves, as well as other students, in the [Fit Explorer Challenge](#).
- Practice physical activities as they train like an astronaut with [Mission Handouts](#).
- Make observations on physical improvements, research fitness and exploration topics, and log their goals in a [Mission Journal](#).
- Engage in hands-on activities to learn about the science of physical activity and the science of nutrition.

## NASA SUMMER OF INNOVATION

### UNIT

Life Science -- The Body

### GRADE LEVELS

4-6 and 7-9

### CONNECTION TO CURRICULUM

Science, Mathematics, Physical Science

### TEACHER PREPARATION TIME

1 hour. Downloading of videos will vary based on connection speeds.

### LESSON TIME NEEDED

4 hours      Complexity: Moderate

## NATIONAL STANDARDS

### National Science Education Standards, NSTA

Science as Inquiry

- Skills necessary to become independent inquirers about the natural world.

Life Science Standards

- Characteristics of organisms.
- Organisms and environments.

Science in Personal and Social Perspectives

- Personal health.

### Common Core State Standards for Mathematics, NCTM

Operations and Algebraic Thinking

- Generate and analyze patterns.
- Analyze patterns and relationships.

Measurement and Data

- Represent and interpret data.

Statistics and Probability

- Develop understanding of statistical variability.
- Summarize and describe distributions.

## **National Physical Education Standards**

Standard 1: Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities.

Standard 2: Demonstrates understanding of movement concepts, principles, strategies and tactics as they apply to the learning and performance of physical activities.

Standard 3: Participates regularly in physical activity.

Standard 4: Achieves and maintains a health-enhancing level of physical fitness.

Standard 5: Exhibits responsible personal and social behavior that respects self and others in physical activity settings.

Standard 6: Values physical activity for health, enjoyment, challenge, self-expression and/or social interaction.

## **National Health Education Standards, Second Edition (2006):**

Standard 1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

0.1.5.1 Describe the relationship between healthy behaviors and personal health.

Standard 4: Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks.

004.5.1. Demonstrate effective verbal and nonverbal communication skills to enhance health.

Standard 5: Students will demonstrate the ability to use decision-making skills to enhance health.

0 5.5.4 Predict the potential outcomes of each option when making a health-related decision.

05.5.6 Describe the outcomes of a health-related decision.

Standard 6: Students will demonstrate the ability to use goal-setting skills to enhance health.

06.5.1 Set a personal health goal and track progress toward its achievement.

Standard 7: Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks.

07.5.2 Demonstrate a variety of healthy practices and behaviors to maintain or improve personal health.

## MANAGEMENT

The activities in this lesson should be done with cooperative groups of two to three students. Safety practices should be reviewed and observed during the activities. *Important! Students should have proper medical clearance on record before participating in any kind of physical activity program.* Hint: If any of the data collection devices listed is new to the students, consider familiarizing the students with that instrument a few days before the physical activity begins. For physical activities, students should wear loose-fitting clothing that permits freedom of movement.

## CONTENT RESEARCH

Review the background information included with each activity. Review and discuss information with students to ensure understanding to allow students to explore the data results and explain their answers and outcomes.

### Key Terms:

- **aerobic activities** -- activities designed to increase the amount of oxygen in the blood.
- **cardiac muscles** -- a special kind of involuntary muscle found in the heart (which works without a person's thinking about it).
- **exercise** -- any physical activity that raises your heart rate or makes you work hard to lift or pull an object, including your own body.
- **joint** -- a place where two or more bones meet.
- **muscles** -- soft but strong tissue made of long fibers that contract or become shorter to move bones. Muscles can only pull in one direction so they must work in pairs.
- **resistive exercise** -- an activity that strengthens bone and muscle by generating force against resistance.
- **skeletal muscles** -- a group of voluntary muscles (muscles that you can control) that are attached to bones or other muscles to help a person move.
- **smooth muscles** -- a group of involuntary muscles (muscles that work without conscious thought) that make up most of the body organs such as the stomach, insides of blood vessels, intestines, and others.
- **stress** -- emotional tension or physical force. Physical stress is created when bones and muscles work against a force.

## MATERIALS

### Walk-Back Mission

#### Educational Resources

- Base Station Walk-Back Mission Handout
- Base Station Walk-Back Mission Log
- Base Station Walk-Back Educator Guide
- Download the Videos
  - ☐ Windows Media (WMV) closed or open captions QuickTime (MOV) closed or open captions
- Mission Journal and pencil
- Optional equipment:
  - watch or stopwatch
  - heart rate monitor
  - pedometer
  - walking wheel

### Crew Strength Training

#### Educational Resources

- Crew Strength Training Mission Handout
- Crew Strength Training Mission Log Crew
- Strength Training Educator Guide
- Download the Videos
  - ☐ Windows Media (WMV) closed or open captions QuickTime (MOV) closed or open captions
- Mission Journal and pencil
- Optional equipment:
  - watch or stopwatch
  - wall access
  - metronome

### Do a Spacewalk

#### Educational Resources

- Do a Spacewalk! Mission Handout
- Do a Spacewalk! Mission Log
- Do a Spacewalk! Educator Guide
- Download the Video
  - ☐ Windows Media (WMV) closed or open captions QuickTime (MOV) closed or open captions
- Mission Journal and pencil
- Tape measure or meter stick
- Optional equipment:
  - Watch or stopwatch.

## LESSON ACTIVITIES

### Base Station Walk-Back

Students will train to improve lung, heart and other muscle endurance as they walk a progressive, measured distance.

[http://www.nasa.gov/audience/foreducators/fitexplorer/train/N\\_Walkback\\_detail.html](http://www.nasa.gov/audience/foreducators/fitexplorer/train/N_Walkback_detail.html)

### Crew Strength Training

Students will train to develop upper and lower body strength in their muscles and bones by performing body-weight squats and push-ups.

[http://www.nasa.gov/audience/foreducators/fitexplorer/train/N\\_CrewStrength\\_detail.html](http://www.nasa.gov/audience/foreducators/fitexplorer/train/N_CrewStrength_detail.html)

### Do a Spacewalk!

Students will train to increase muscular strength and improve upper and lower body coordination by performing the “bear crawl” and the “crab walk.”

[http://www.nasa.gov/audience/foreducators/fitexplorer/train/N\\_Spacewalk\\_detail.html](http://www.nasa.gov/audience/foreducators/fitexplorer/train/N_Spacewalk_detail.html)

### Jump for the Moon

Students will train to increase bone strength and to improve heart and other muscle endurance by performing jump training with a rope, both while stationary and moving.

[http://www.nasa.gov/audience/foreducators/fitexplorer/train/N\\_JumpMoon\\_detail.html](http://www.nasa.gov/audience/foreducators/fitexplorer/train/N_JumpMoon_detail.html)

### Mission: Control!

Students will train to improve balance and spatial awareness by performing throwing and catching techniques on one foot.

[http://www.nasa.gov/audience/foreducators/fitexplorer/train/N\\_MissionControl\\_detail.html](http://www.nasa.gov/audience/foreducators/fitexplorer/train/N_MissionControl_detail.html)

## ADDITIONAL RESOURCES

To learn about exercise used during past and future space flight missions, visit

<http://hacd.jsc.nasa.gov/projects/ecp.cfm>

Access fitness-related information and resources at <http://www.fitness.gov>

View programs on health and fitness: Scifiles™ The Case of the Physical Fitness Challenge

<http://www.knowitall.org/nasa/scifiles/index.html>

NASA Connect™ Good Stress: Building Better Bones and Muscles

<http://www.knowitall.org/nasa/connect/index.html>

For more information on the neurovestibular system, visit: NASA's Web of Life

The Effects of Space Flight on the Human Vestibular System

<http://weboflife.nasa.gov/learningResources/vestibularbrief.htm>

## MATERIALS

### Jump for the Moon

#### Educational Resources

- Jump for the Moon Mission Handout
- Jump for the Moon Mission Log
- Jump for the Moon Educator Guide
- Download the Video
  - Windows Media (WMV) closed or open captions QuickTime (MOV) closed or open captions
- Mission Journal and pencil
- Jump rope (one per student)
- Watch or stopwatch
- Optional equipment:
  - Heart rate monitor

### Mission: Control!

#### Educational Resources

- Mission: Control! Mission Handout
- Mission: Control! Mission Log
- Mission: Control! Educator Guide
- Download the Video
  - Windows Media (WMV) closed or open captions QuickTime (MOV) closed or open captions
- Mission Journal and pencil
- Practice:
  - Tennis ball (one per student)
  - Watch or stopwatch (one per student)
  - Game: gym ball or similar sized/weighted ball (at least one per group)

## DISCUSSION QUESTIONS

**Note: This is a sample of the questions available for each activity in the educator guide.**

Use the following open-ended questions before, during and after practicing the physical activity to help students make observations about their own physical fitness level and their progress in the physical activity:

- How do you feel?  
Answers will vary.
- How far did you get?  
Answers will vary.
- What happened to your heart rate?  
Answers will vary depending on when question is asked. Increase for during physical activity or decrease for after physical activity.
- Where is the energy you are using coming from?  
Food, combined with oxygen, is the source of the body's energy.
- What do your legs feel like now compared to when we first tried this physical activity?  
Answers will vary.
- Can you describe how your breathing changed during the physical activity?  
Answers will vary.
- How did your body cool itself during the physical activity?  
Perspiration or sweating.
- How well would your body cool itself if you were wearing a thick coat?  
Answers will vary.
- What are some challenges astronauts might face in completing a walk-back to their base station?  
Answers will vary.
- How might these challenges affect their ability to perform the walk-back? Answers will vary.

## ASSESSMENT ACTIVITIES

The Mission Journal is the major assessment item for these activities. Student observations about their physical activity and answering the discussion questions from each activity will provide teachers with important feedback about student understanding. However, the opportunities for individual podcasts, oral reports, etc., on their experience are viable alternatives or additions.

## ENRICHMENT

### The Science of Physical Activity

#### Living Bones, Strong Bones

Engineering, nutrition and physical activity collide when students design and build a healthy bone model of a space explorer that is strong enough to withstand increasing amounts of weight. Learn more at

[http://www.nasa.gov/audience/foreducators/fitexplorer/education/N\\_LBSB\\_detail.html](http://www.nasa.gov/audience/foreducators/fitexplorer/education/N_LBSB_detail.html).